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Title: | COUPLED ENVIRONMENTAL MODELING - WATER RESOURCES SIMULATION IN THE RIO GRANDE

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Submitted to:

Goal

To model the water balance of the Rio Grande to determine the disposition and fluxes of both surface and groundwater. This effort will be cooperative with federal, state and local agencies and universities.

Overview of the Rio Grande

Semiarid basin typical of many in the world

Runoff dominated by snowmelt with increasing contribution of summer rainfall on southern tributaries

Water use is both surface water and groundwater

Groundwater recharge by river flow

Approach

Rio Grande simulation includes weather/landsurface from the head waters to Cochiti Reservoir and groundwater for the Española Basin

Examine the regional Rio Grande Basin in its global context - use coupled ocean-atmosphere model results or data for boundary conditions

Couple regional climate model, land surface model, river routing model, and groundwater model for Rio Grande water balance simulation

Estimate model parameters and test models using data collected by remote sensing and ground-based stations
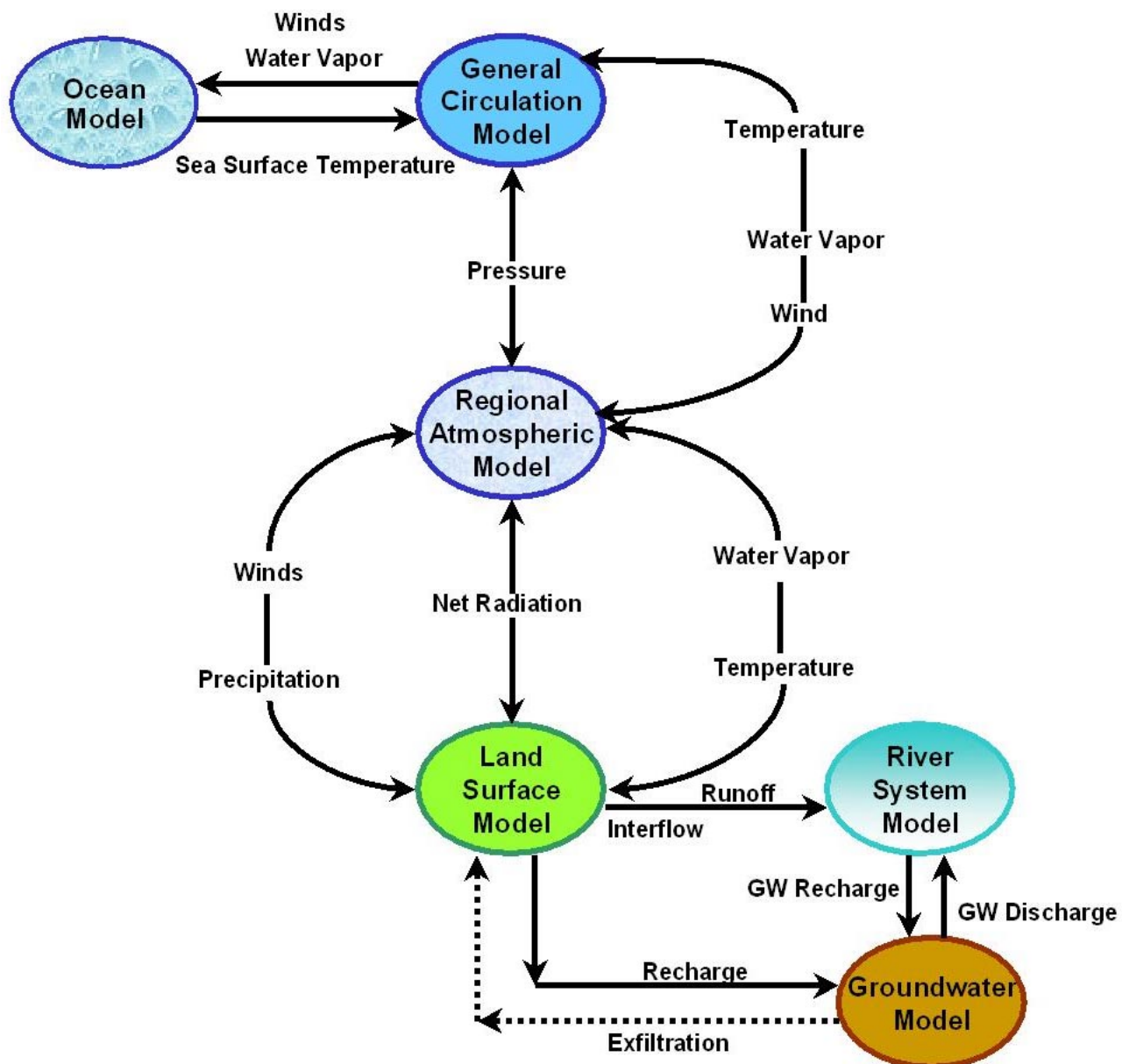
Model components:
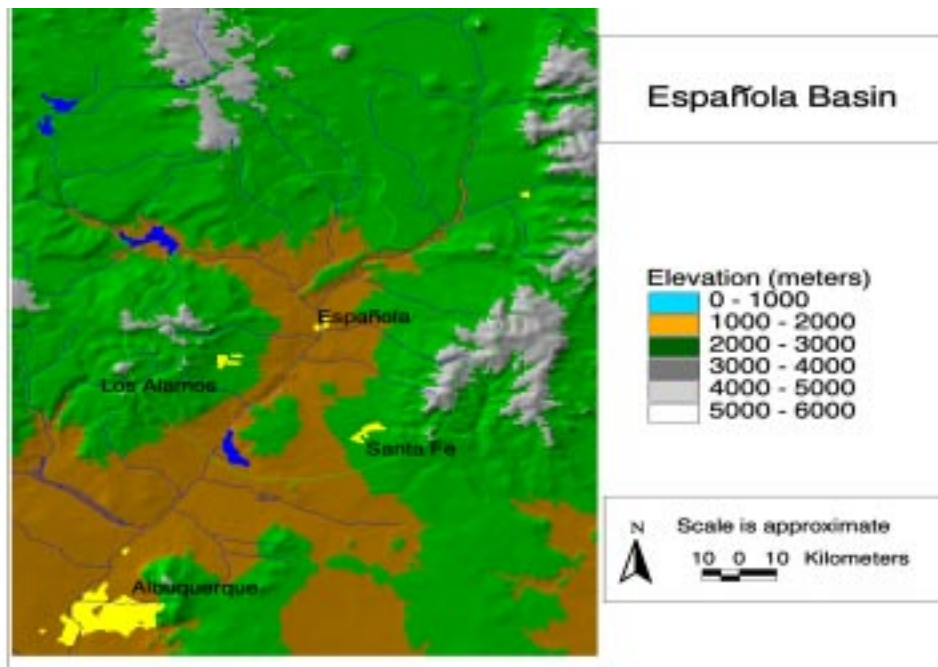
Atmosphere - Regional Atmospheric Simulator (RAMS)

Land surface - Simulator for Processes of Landscapes, Surface/Subsurface Hydrology (SPLASH)

Streamflow - Dynamic Wave Operational Model (DWOPER)

Subsurface - Finite Element Heat and Mass (FEHM)

Components Resolution:

•RAMS - 5kmx5km grid cel

•SPLASH - 100mx100m grid cell

•FEHM - 1kmx1km grid cell

Española Basin

Elevation (meters)
0 - 1000
1000 - 2000
2000 - 3000
3000 - 4000
4000 - 5000
5000 - 6000

N   Scale is approximate
    10 0 10 Kilometers

DWOPER

•Implicit solution to the one-dimensional unsteady flow equation

•Dams and diversions are included

Metamorphic/igneous   Basalts

Sedimentary basin fill   Puye fanglomerate

Silicic volcanics
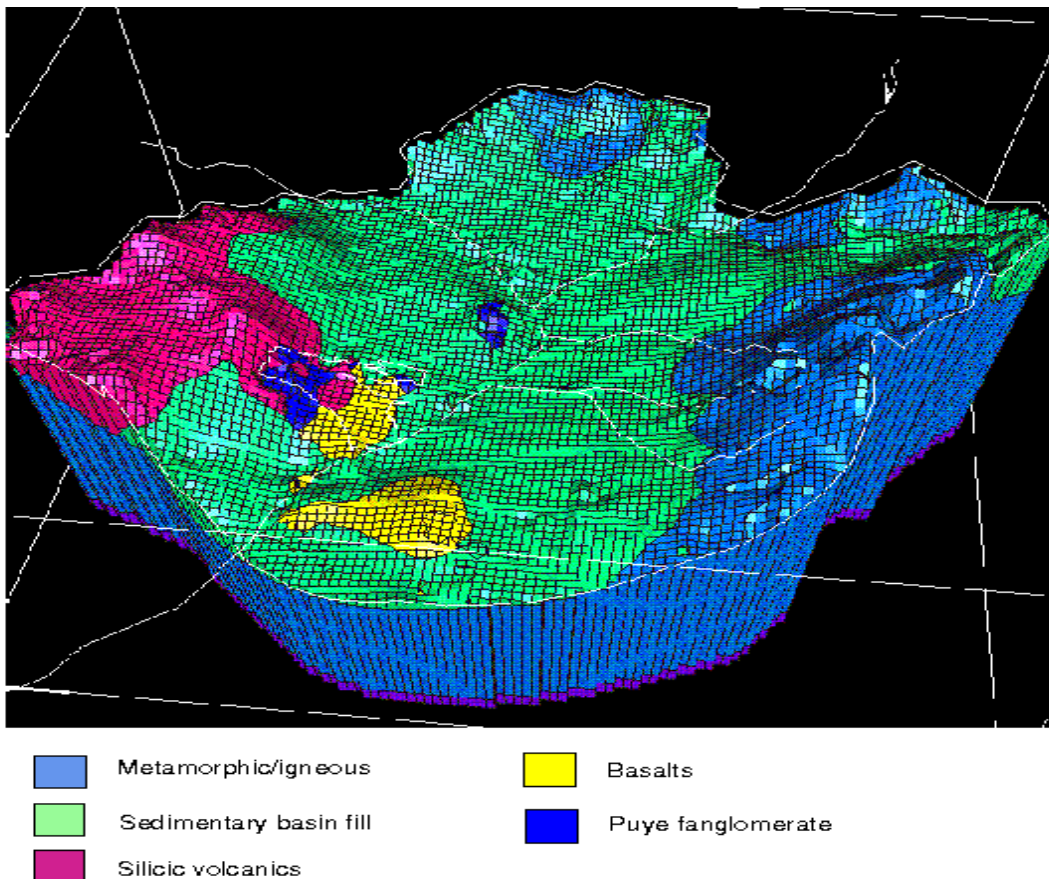
•We are constructing a groundwater flow model for the Española Basin, using the finite element code FEHM. To account for geologic controls on permeability, we have developed a 3-D geologic framework model for the basin.

•This figure illustrates some of the geologic features present in the model. Precambrian basement rocks define the bottom surface; the regional water table defines the top.

Upper Rio Grande Basin
Total Accumulated Precipitation
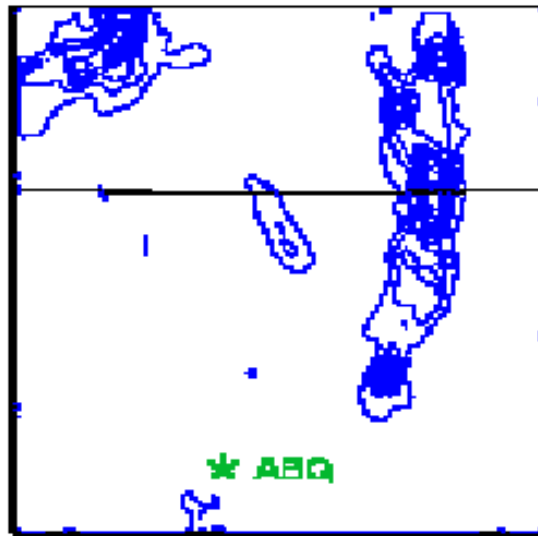### 31 December 1995 - 2 January 1996
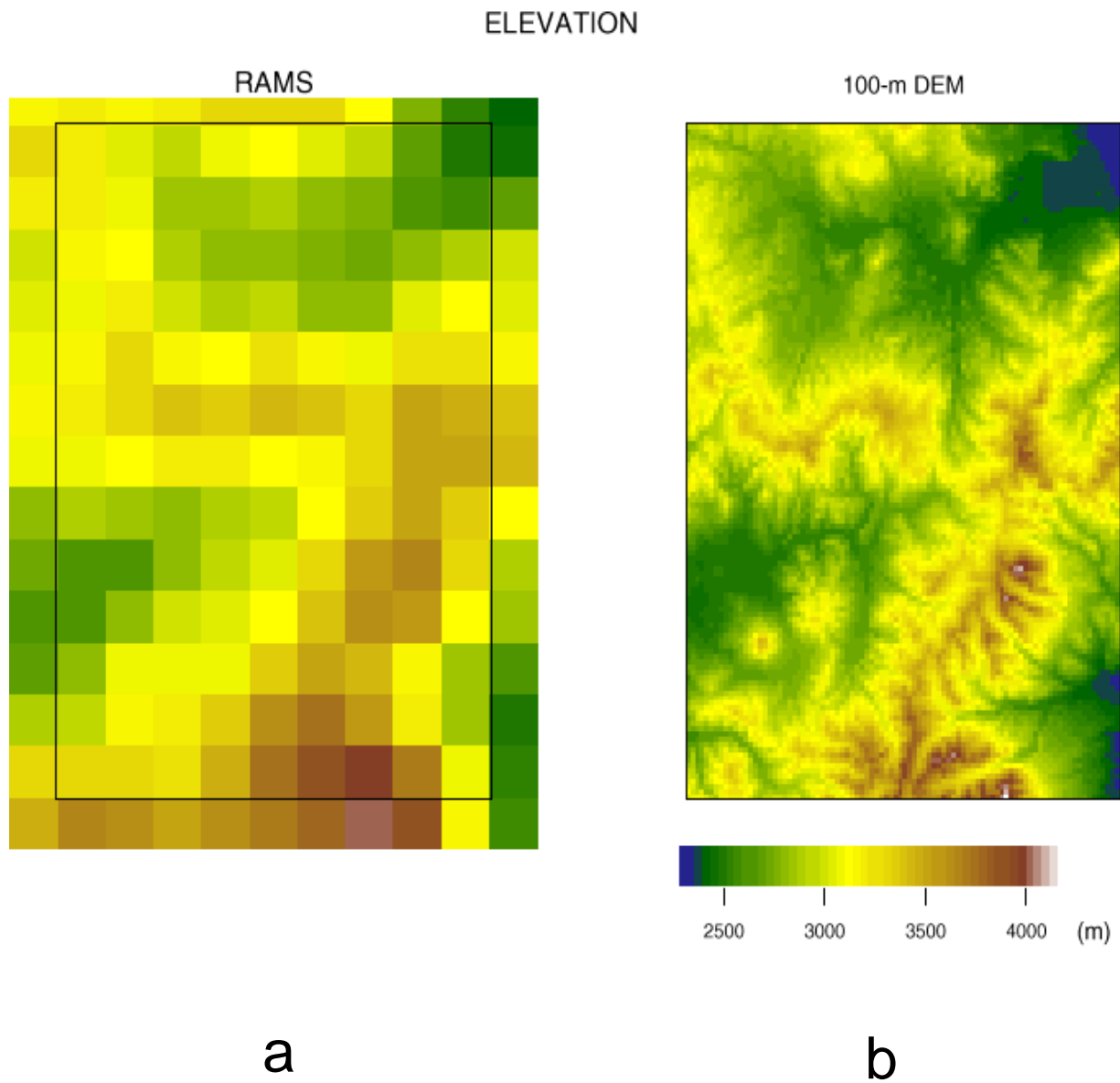
Run with two grids

20 Km grid spacing on grid 2
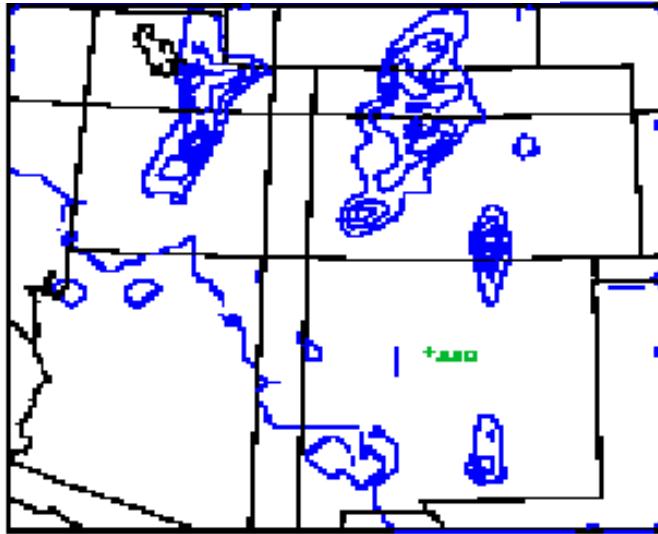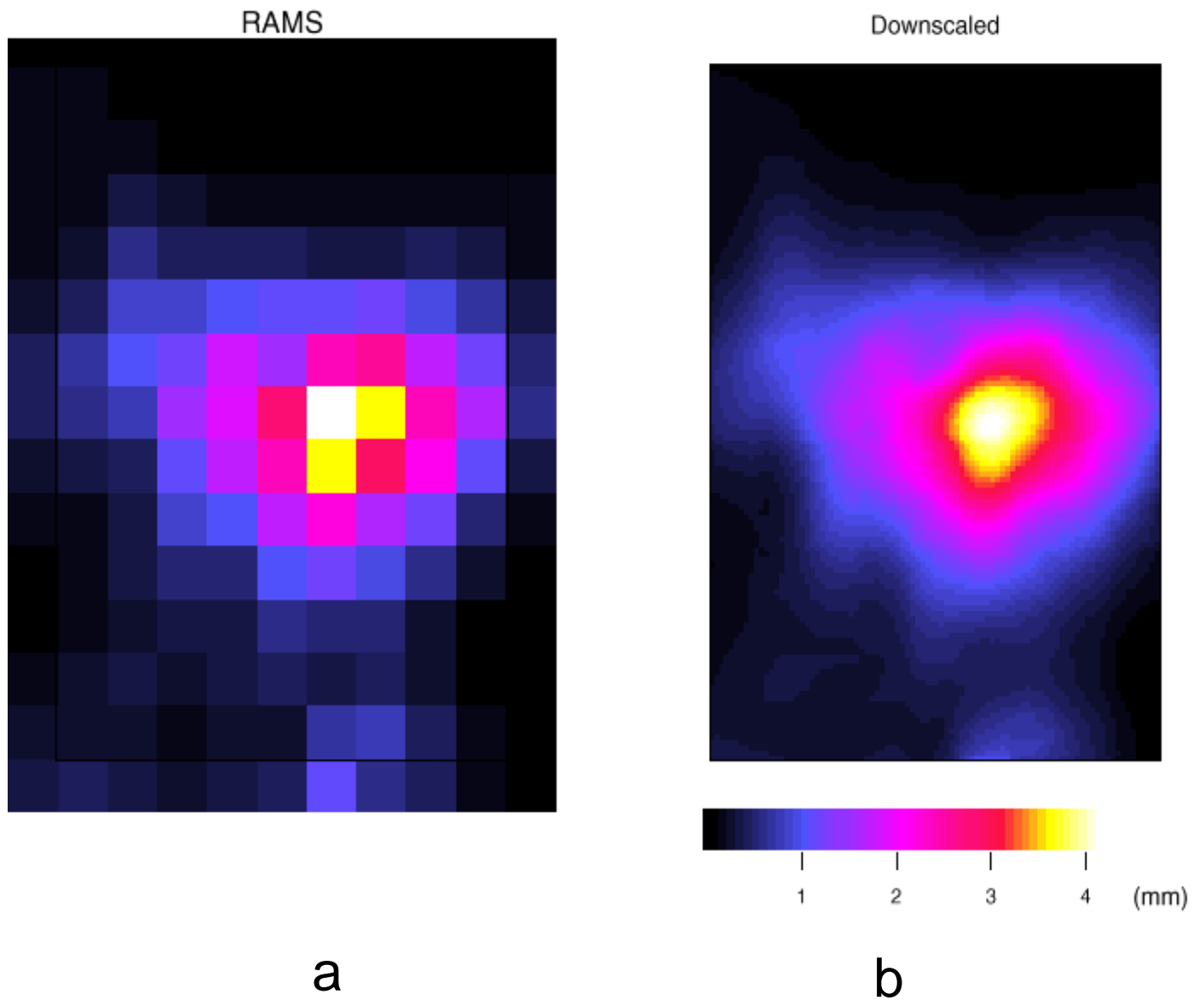

Run with three grids

5 Km grid spacing on grid 3

10 mm contour level

Effect of grid resolution in RAMS on simulating precipitation in the Rio Grande Basin for an event.

ELEVATION

Topography represented at 5-km grid cells by
RAMS (a) and the 100-m cells used for the
land surface model (b).

PRECIPITATION

RAMS

Downscaled

a

b

Precipitation is downscaled using a geostatistical technique from the 5-km RAMS grid (a) to the 100-m land surface grid (b).

Soil Moisture Map
of the
Upper Rio Grande Basin